Reference (12)

DECLARATION

I, Maho KASEKI, c/o the Inoue & Associates of 3rd Floor, Akasaka Habitation Building, 3-5, Akasaka 1-chome, Minato-ku, Tokyo, Japan do solemnly and sincerely declare that I am conversant with the Japanese and English languages and that I have executed with the best of my ability this partial translation into English of Unexamined Japanese Patent Application Laid-Open Specification No. 2002-287528 and believe that the translation is true and correct.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

December 11, 2004
(Date)

Maho KASEKI

Partial English Translation of Unexamined Japanese

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(54) [Title of the Invention] Semiconductive belt and method for producing the same

(2) Page 2, left-hand column, lines 1 to 36:

[Scope of Claims for Patent]

[Claim 1] A semiconductive belt formed from a polyimide resin containing carbon black particles, which has a surface roughness (Ra) of 0.5 μm or less, as measured in accordance with JIS B0601(1994), and a surface dynamic friction coefficient of 0.8 or less.

[Claim 2] The semiconductive belt according to claim 1, wherein carbon black particles contained in said polyimide resin comprises substantially no particles having a particle diameter of 0.5 μm or more.

[Claim 3] The semiconductive belt according to claim 1 or 2, wherein the common logarithm of the surface resistivity measured of said semiconductive belt is in the range of from 9 to 13 (log Ω/□) and the difference between the maximum and minimum values of the common logarithm is 1.0 (log Ω/□) or less.

[Claim 4] The semiconductive belt according to any one of claims 1 to 3, wherein the amount of said carbon black particles is in the range of from 5 to 30 % by weight, based on the weight of said polyimide resin in terms of the weight of the solids contained therein.

[Claim 5] The semiconductive belt according to any one of

claims 1 to 4, wherein said carbon black is a channel black or a furnace black subjected to an oxidation treatment.

[Claim 6] A process for producing a semiconductive belt, which comprises: applying a polyamide acid solution having carbon black uniformly dispersed therein onto an inner wall of a cylindrical mold, in which the inner wall has a surface roughness (Ra) of 1.0 μm or less, followed by rotating said cylindrical mold around the axis thereof, to thereby form a film on the inner wall of said mold; heating the resultant cylindrical mold to evaporate a solvent from the film so as to obtain a cured film which, in an independent form thereof, is capable of supporting itself, followed by removing the cured film from said mold; and applying the cured film onto an outer wall of a metal cylinder, wherein the surface roughness (Ra) of the outer wall of the metal cylinder is in the range of from 0.2 to 3.0 μm, followed by heating the resultant metal cylinder to thereby effect the imide conversion reaction of the cured film.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] The present invention relates to a semiconductive belt for use in an image forming apparatus, such as an electrophotographic copying machine, an electro-

photographic printer, an electrophotographic facsimile or a multifunctional apparatus having functions of these apparatuses. More particularly, the present invention is concerned with a semiconductive belt which can be advantageously used as a functional belt in an intermediate transfer means, a transfer means and a transfer fixation means of the above-mentioned image forming apparatuses.

(3) Page 3, left-hand column, lines 27 to 42:

[0014] Commercially available carbon blacks can be used as carbon black contained in the semiconductive belt of the present invention. Specific examples of such carbon blacks include a channel black and a furnace black. With respect to the furnace black, the dispersibility thereof in a solvent can be improved by an oxidation treatment and, hence, a furnace black which has been subjected to an appropriate oxidation treatment is preferred. Thus, as a carbon black used in the present invention, it is preferred to use either a channel black or a furnace black subjected to an oxidation treatment.

[0015] With respect to the semiconductive belt of the present invention, it is preferred that carbon black particles contained in the polyimide resin comprise substantially no

particles having a particle diameter of 0.5 μm or more, more advantageously 0.3 μm or more. In the present invention, the term "particle diameter" means a particle diameter of an agglomerate of primary particles of carbon black, and it is a value measured by an observation under an SEM (scanning electron microscope) or a TEM (transmission electron microscope).

(4) Page 4, left-hand column, line 2 to right column, line 8:

[0027]

[Mode for Carrying out the Invention] The semiconductive belt of the present invention is a semiconductive belt comprising, at least at a surface thereof, a polyimide resin layer having uniformly dispersed therein carbon black particles as conductive microparticles. The semiconductive belt may be composed of a single layer or a plurality of different layers. With respect to the carbon black particles contained in the polyimide resin, it is preferred that the carbon black particles comprise substantially no particles having a particle diameter of 0.5 μm or more, more advantageously 0.3 μm or more.

[0028] In general, the particle diameters of primary particles of carbon black are in the range of from 10 nm to 1 μm.

However, when the primary particles of carbon black are dispersed in a dispersion medium or in a resin, the carbon black particles may be agglomerated. When the carbon black particles dispersed in the polyimide resin comprise particles having a particle diameter of 0.5 μm or more, such carbon black particles having a large particle diameter, which are present in the surface portion of the semiconductive belt, may form protrusions at the surface of the semiconductive belt during the production thereof. Such protrusions formed at the surface of the semiconductive belt may cause problems, such as lowering of a surface precision and uneven surface resistivity of the semiconductive belt. In addition, the protrusions may cause a lowering of the resistivity of the semiconductive belt due to the electrical load applied to the semiconductive belt.

[0029] As carbon black used in the present invention, a channel black and a furnace black are preferred. With respect to the furnace black, the dispersibility thereof in a solvent can be improved by oxidation treatment and, thus, a furnace black which has been subjected to an appropriate oxidation treatment is preferred. The furnace black which has been subjected to an oxidation treatment has an oxygen-containing functional group (e.g., a carboxyl group, a ketone

group, a lactone group or a hydroxyl group) bonded to the surface thereof and, hence, such a furnace black exhibits an excellent affinity to a polar solvent and becomes less susceptible to an oxidative degradation at the surface of carbon black which is caused by the electrical load applied to the semiconductive belt. When such a carbon black is used in the semiconductive belt of the present invention, the formation of a conductive channel in the semiconductive belt is suppressed, thereby preventing the lowering of the resistivity of the semiconductive belt.

[0030] Specific examples of channel blacks used in the semiconductive belt of the present invention include Color Black FW200, Color Black FW2, Color Black 2V, Color Black FW1, Color Black FW18, Special Black 6, Color Black S170, Color Black S160, Special Black 5, Special Black 4, Special Black 4A, Printex 150T, Printex U, Printex V, Printex 140U and Printex 140V (each manufactured and sold by Degussa AG). Specific examples of furnace black which has been subjected to an oxidation treatment include Special Black 550, Special Black 350, Special Black 250 and Special Black 100 (each manufactured and sold by Degussa AG); MA100, MA100R, MA100S, MA11, MA230, MA220, MA7, MA8 and MA77 (each manufactured and sold by Mitsubishi Chemical Corporation); and Monarch 1000,

Monarch 1400, Monarch 1300, Mogul-L and Regal 400R (each manufactured and sold by Cabot Corporation).

[0031] The semiconductive belt of the present invention is produced from a polyimide resin which is obtained by dispersing the above-mentioned carbon black in a polyimide resin. As a raw material for the polyimide resin, there can be mentioned a polyamide acid solution obtained by effecting a polymerization reaction of a tetracarboxylic acid dianhydride or a derivative thereof with a diamine in the presence of a solvent. Specifically, the polyamide acid can be obtained by reacting a tetracarboxylic acid dianhydride or a derivative thereof with a diamine, each used in an approximate molar amount, in the presence of an organic solvent. Generally, the polyamide acid is obtained in the form of a solution.